The Actuarial Profession
making financial sense of the future

GIRO Conference and Exhibition 2012
Juggling uncertainty the actuary's part to play

19 September 2012

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making financial sense of the future

GIRO Conference and Exhibition 2012

Update from the PPO working party

Mark Cockroft, Novae Re

Antony Claughton, DLG

Sarah MacDonnell, Towers Watson

Thanks to the working party members

- Clare Barley
- Nick Betteridge
- Antony Claughton
- Mark Cockroft (chair)
- Dorian Hicks

- Sarah MacDonnell
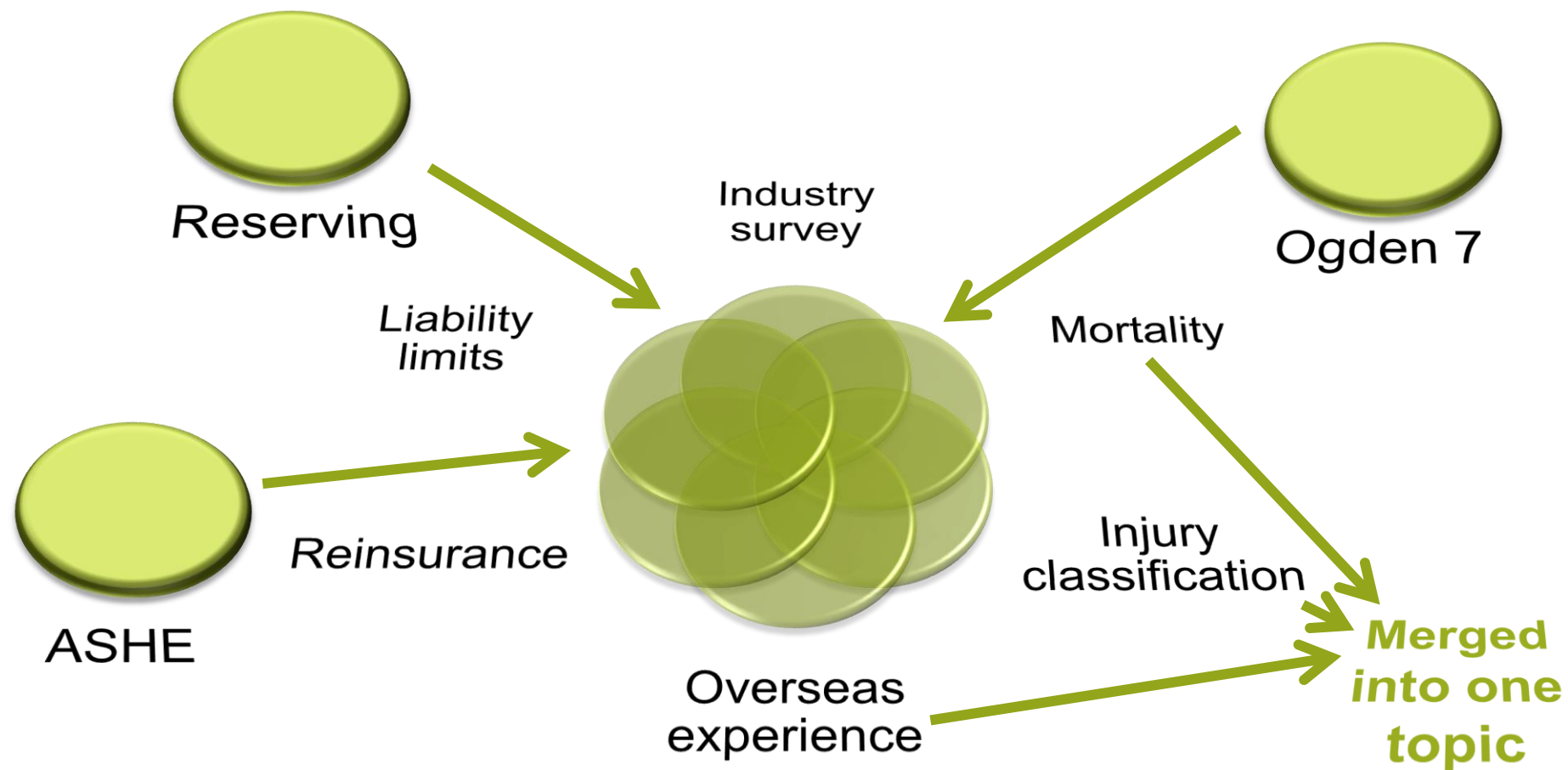- Christina Ruffle
- Peter Saunders
- Tony Stanger

Agenda

- Update on working party activity

- Focus on ASHE

- Industry survey results

Agenda

- Update on working party activity
- Focus on ASHE
- Industry survey results

Update on working party activity

Impaired life mortality

- One of the "big 3" questions of PPOs: how many, how big, how long for

- Ongoing analysis, no conclusions yet

- Emphasis this year on data sources:
  - Overseas experience (NZ, Aus)
  - Published medical research
  - Own data extraction: industry survey & GP database

- Not just change in future life expectancy but **shape** of mortality adjustment and **how** to adjust

- Target is a UK Impaired Life Mortality table: not there yet

Impaired life mortality (cont'd)
Some initial feedback

- Best medical paper: *McMillen et al; 2011, Journal of Neurology, Neurosurgery & Psychology*
  - Impact of head trauma is highest in first year post-accident, diminishing impact in years 2-13
  - Higher relative impact for patients ages 15-54 vs 55+
- Comparing data requires good classification of injury
  - Internationally standardised scales can help
- Adjusting for other factors (obesity, smoking) is important
- Other than GP database, our potential data sets are small
- Adjusting claimant age may not be good enough: look at q_x

Reinsurance

- IUA XoL motor questionnaire Appendix 5 needs updating:
  - stepped PPOs (survey shows ~30% of PPOs are stepped)
  - multiple heads of damage covered by PPO
  - unlimited numbers of accident years
- Insurer concern over interaction of PPO and indexation clause
  - alternative options, some of which could be expensive
  - capitalisation clause
- Lessons from life reinsurance
  - Longevity swaps (difficult but interesting)
  - Use of medical underwriting, mortality assumptions, etc

Liability limits

- No obvious cases in which liability indemnity limit would be likely breached by PPO
  - apparent that courts & claimants are getting good advice
- Number of PPO cases remains low and propensity* much lower than that of motor
  - so it is likely that limits are playing a part in decision process
  - but could be just due to severity/nature of injury
- Empirically, higher limits are being sought by some buyers, perhaps in response to this issue

* propensity = no. PPOs as % of no. large claims >£1m lump sum equivalent

Ogden multiplier tables version 7 (Ogden 7)

Select comments

- Based on 2008 mortality data so a bit of a delay in publication
  - some new processes, so release of next update should be a lot quicker, likely early next year based on 2011 data
- Using official ONS mortality projections
  - but notes "*...debate [whether] significant improvements in mortality...can continue unabated*"
- Change in range of net discount rates from 0 - 5% to -2 - +3%
  - "*...merely to provide tools...*" in case net discount rate changes

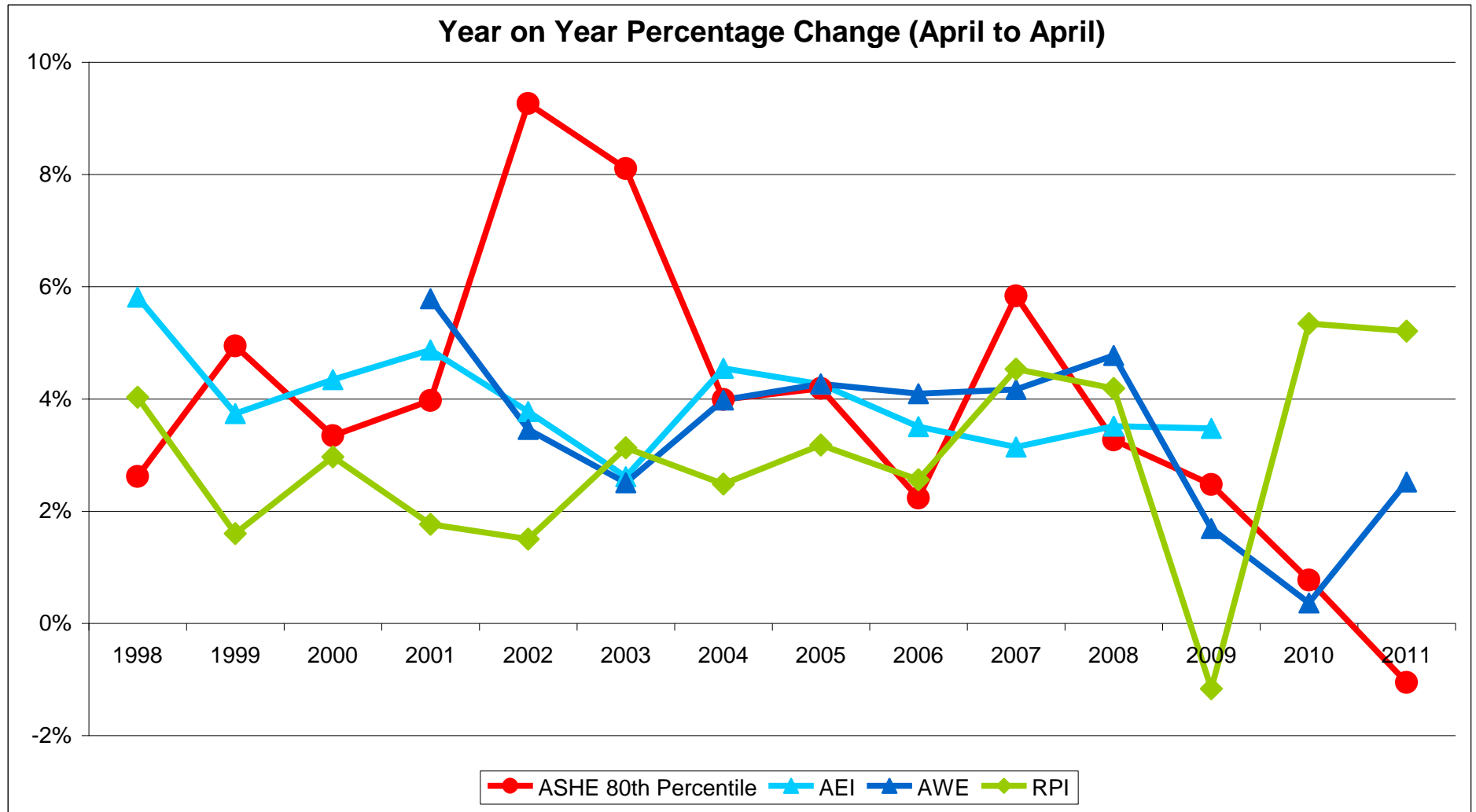# Ogden 7 (cont'd)

Impact vs Ogden 6

- Below are % increase to lump sum value of awards
  - Whole-of-life, unimpaired
  - 2.5% net discount rate

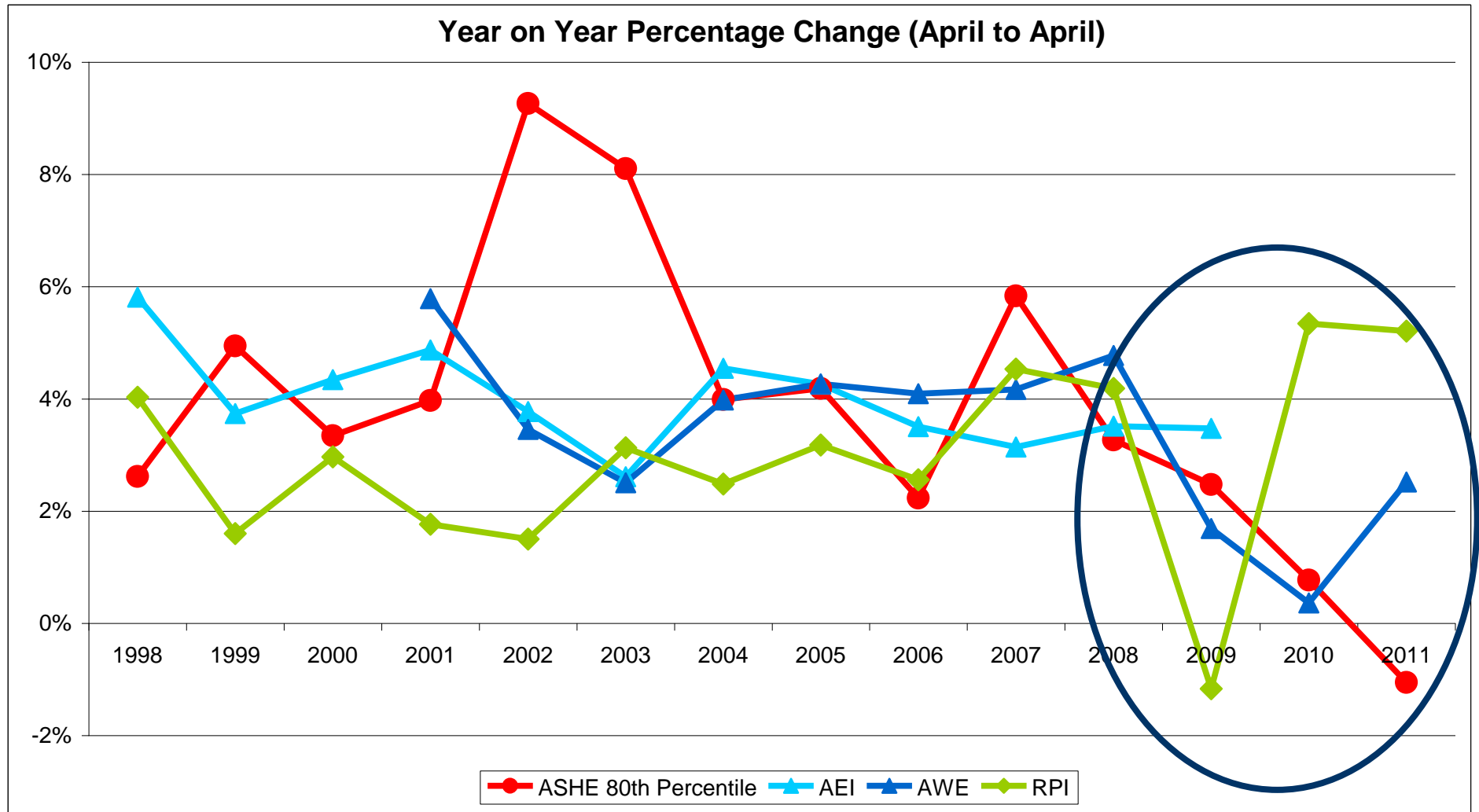| Age	Male	Female
5	+0.90%	+0.82%
15	+1.28%	+1.13%
30	+1.89%	+1.76%
45	+3.43%	+2.89%
60	+5.78%	+4.70%

Agenda

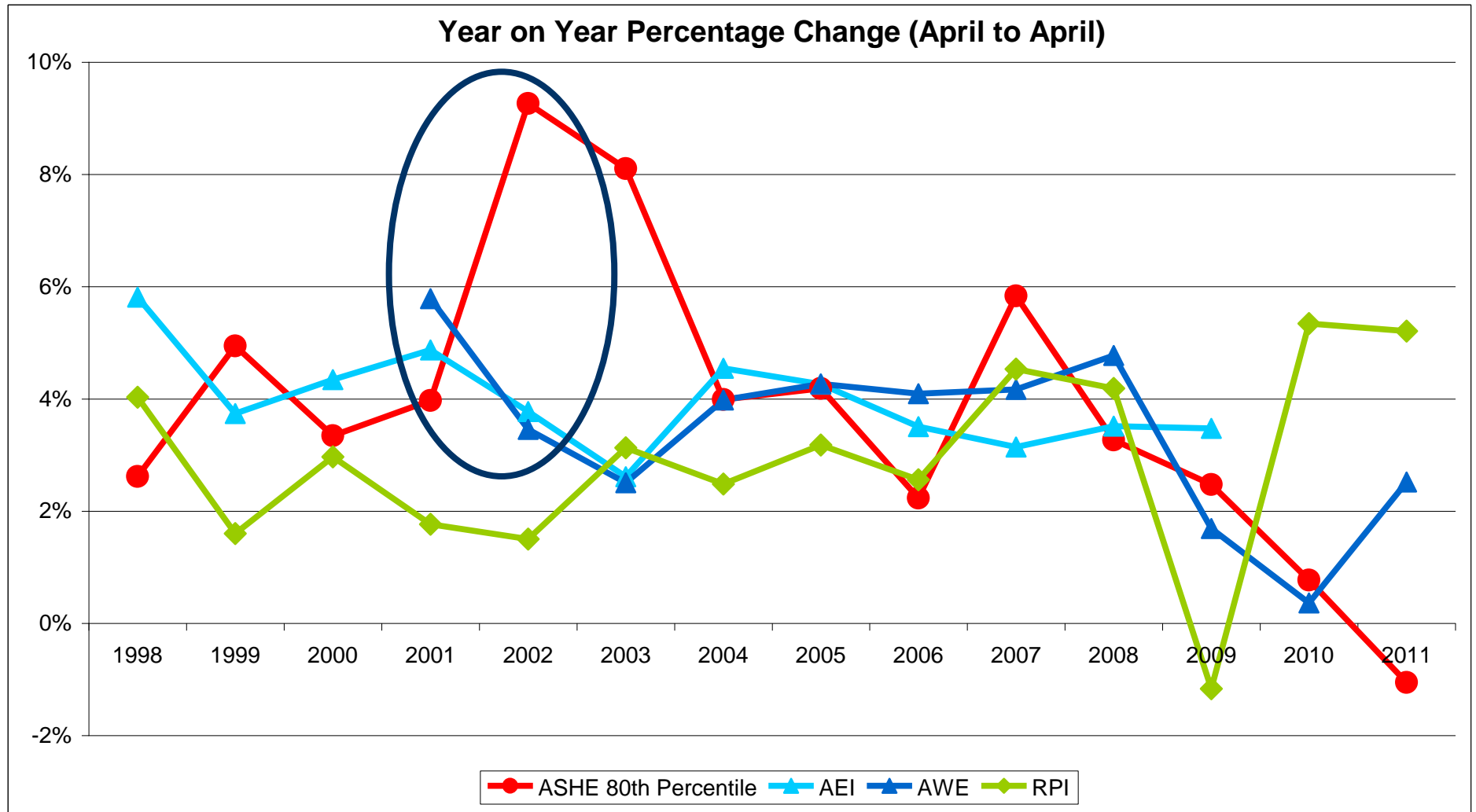- Update on working party activity
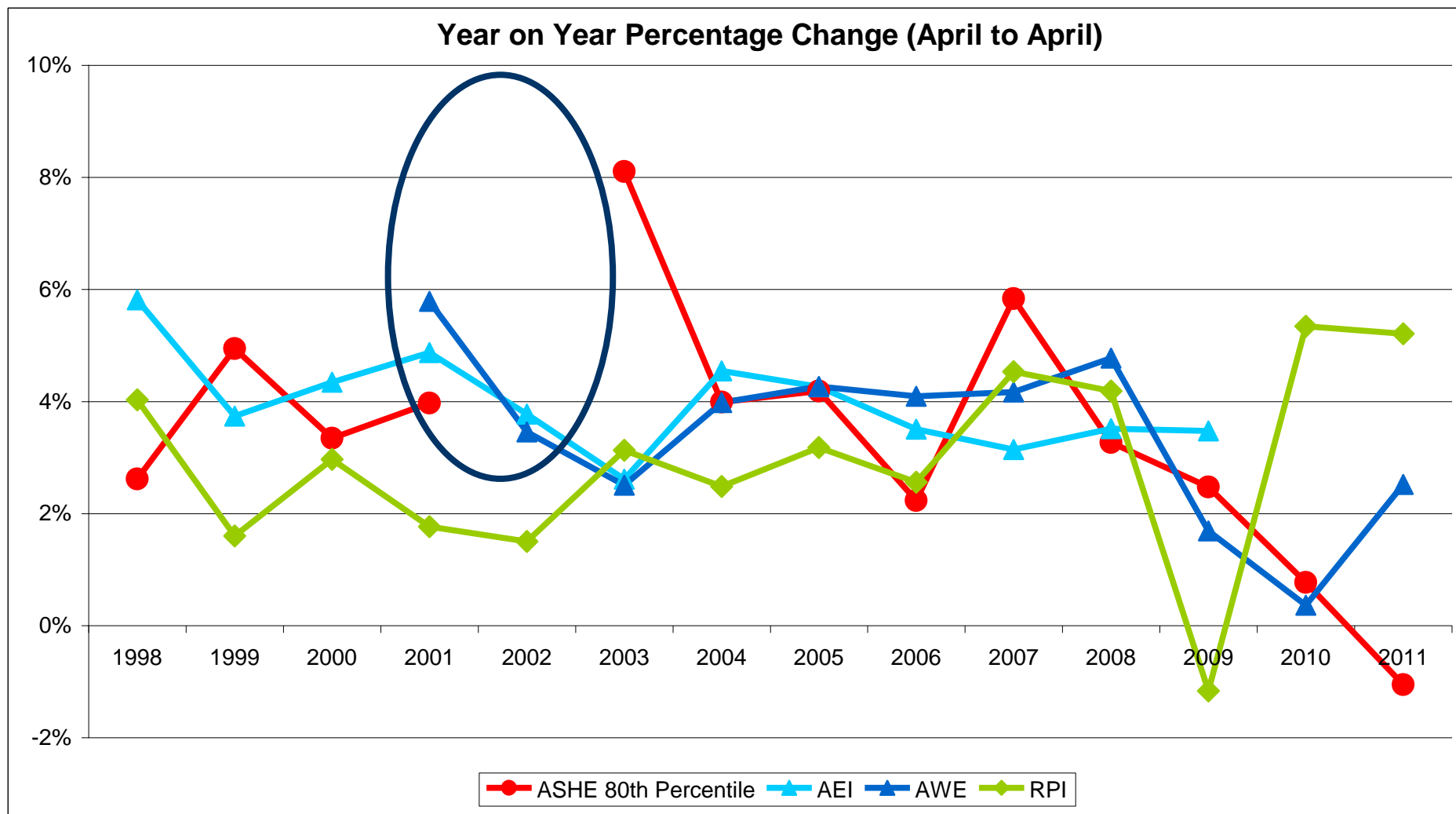- Focus on ASHE
- Industry survey results

ASHE to date

Year on Year Percentage Change (April to April)

ASHE to date

Year on Year Percentage Change (April to April)

Legend: ASHE 80th Percentile, AEI, AWE, RPI

ASHE to date

Year on Year Percentage Change (April to April)

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Year on Year Percentage Change (April to April)

Legend: ASHE 80th Percentile, AEI, AWE, RPI

Average inflation

Inflation period and ASHE indices	ASHE 80th percentile	Combined wage inflation	RPI
644 + 6115	3.8%	3.7%	2.9%
644 + 6115 Exc. 2002	3.4%	3.7%	3.0%
6115 Only	3.3%	3.1%	3.3%
6115 Exc. 2003	2.7%	3.2%	3.3%
6115 2004 ➔ 2009	3.7%	3.8%	2.6%

- Selection period for ASHE can change inflation rates by 1.0%

- It also changes relationship to wage and price inflation. The gap varies from -0.5% to 0.2% for wages and -0.6% to 1.1% for RPI

- Periods with highest ASHE/wage inflation have lowest price inflation and vice versa

* Wages are AEI and then AWE from 2000 onwards

Future ASHE

- There is no forward ASHE projection in the market – so how do you estimate the future rate?
  - For both the short and long term
- Traditionally link to another index
- RPI, wages, or investment return make the most sense

Linking to RPI

- RPI has the advantage that the market explicitly prices it – by comparing the yield of indexed linked gilts to standard gilts
- However, in the very limited pool of ASHE inflation points either a weak or negative correlation is observed with RPI
  – This may be due to the fact both RPI and wages generally increase, leading to weak correlation, but not always to the same degree in the same period
  – It may also be due to a small sample size
  – Where the future assumption has any short term matching implications, RPI could have a problem
- From 1990 to 2011 the RPI inflation has been 3.2%

Linking to Wages

- Wages correlation with ASHE varies, but against the 6115 period (80th percentile) gets as high as 62% when 2003 is excluded

- Obvious issue – there is no market agreed forecast of wage inflation

- The analysis of wages vs. ASHE indicates gaps of differing amounts. However, adopting a gap is implicitly making an assumption about changes in the economy

- From 1990 to 2011 the wage inflation has been ~4.1%

Implications of a difference to wage inflation

Ratio of Carers' earnings to All Employees' earnings
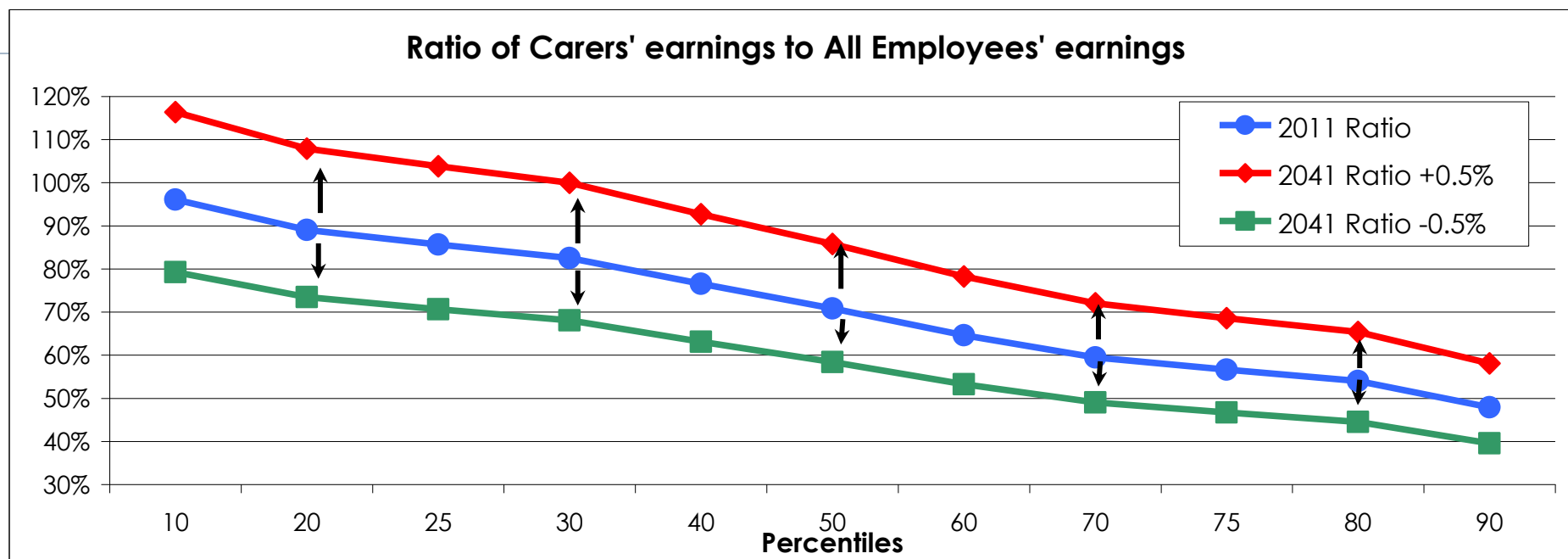
- A 0.5% gap over 40 years moves carers' wagers either up 10% to 20% or down -8% to -17% in comparison to the all workers

- To accept this shift obviously a number of assumptions must be made – which may not have truly been intended from adopting a gap between wage inflation and carers' inflation

Linking to Investment Return

- Performing some high level analysis of historical investment return and wage experience is very interesting

- Quarterly wages inflation and the quarterly two year swap rate are correlated at 79% over Q1 1991 to Q3 2011.
  - The two year swap rate is 99% correlated with the one year rate, and was used as more data was available

- Analysis indicates a gap between wages and the investment return that has varied from 0.5% to 1.0%, depending on the period and the wage index used. This might be argued down to zero given low investment returns
  - Would a long term gap assumption make sense with the current very low yields in the short term?
  - It is justifiable based on other experience?

* Swap rates are the basis of the EIOPA Solvency II risk free yield curve

Japanese experience
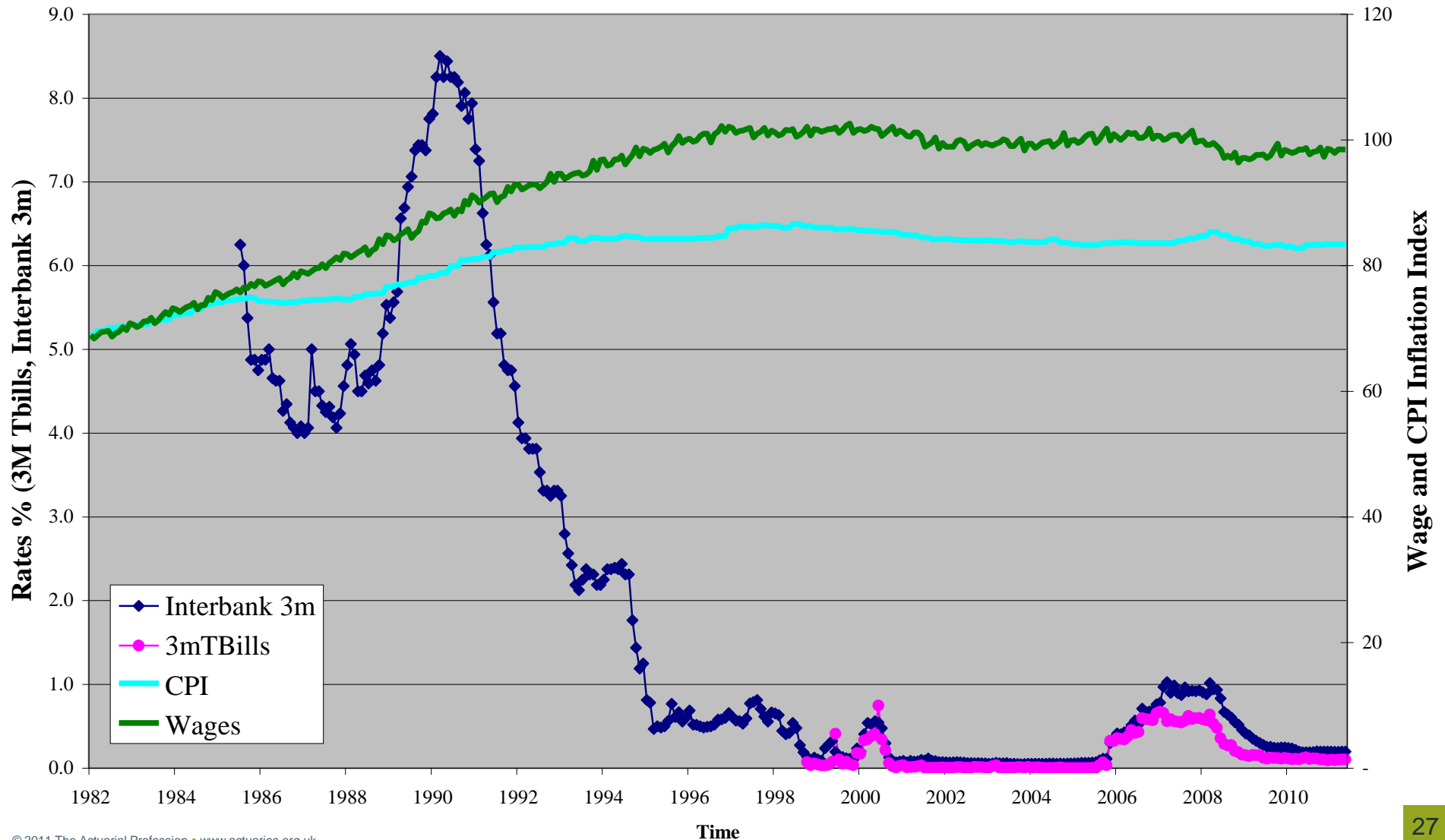
Summary

- There is limited ASHE 6115 data available, and many points might be considered outliers in a larger set
  - This creates uncertainty in identifying the true behaviour and questions over putting reliance on any observations
  - There is also a risk it may be discontinued – but all ASHE percentiles face this risk. ASHE pre 2003 is not the same as ASHE 6115
- Adopting a gap to wages implies changing relationship between carers and the total population.
- There are potential issues with linking ASHE to price inflation – it may be worth investigating linking it to investment returns.

Agenda

- Update on working party activity

- Focus on ASHE

- **Industry survey results**

Disclaimer

- These slides have been produced solely to support this specific presentation and may be misleading if read in isolation.

- Do not rely on any of the information contained herein without reference to the accompanying GIRO paper "Periodical Payment Orders working party update – GIRO 2012"

Data basics

- Third year of the survey
  - 2011: 12 companies
  - 2012: 16 companies
- Comprehensive view of the UK motor market
  - 9 out of the top 10 insurers (as defined by FSA returns)
  - > 94% of market (as defined by FSA returns)
- Cannot directly compare data from year to year
  - change in mix of companies
  - complete refresh of data each year
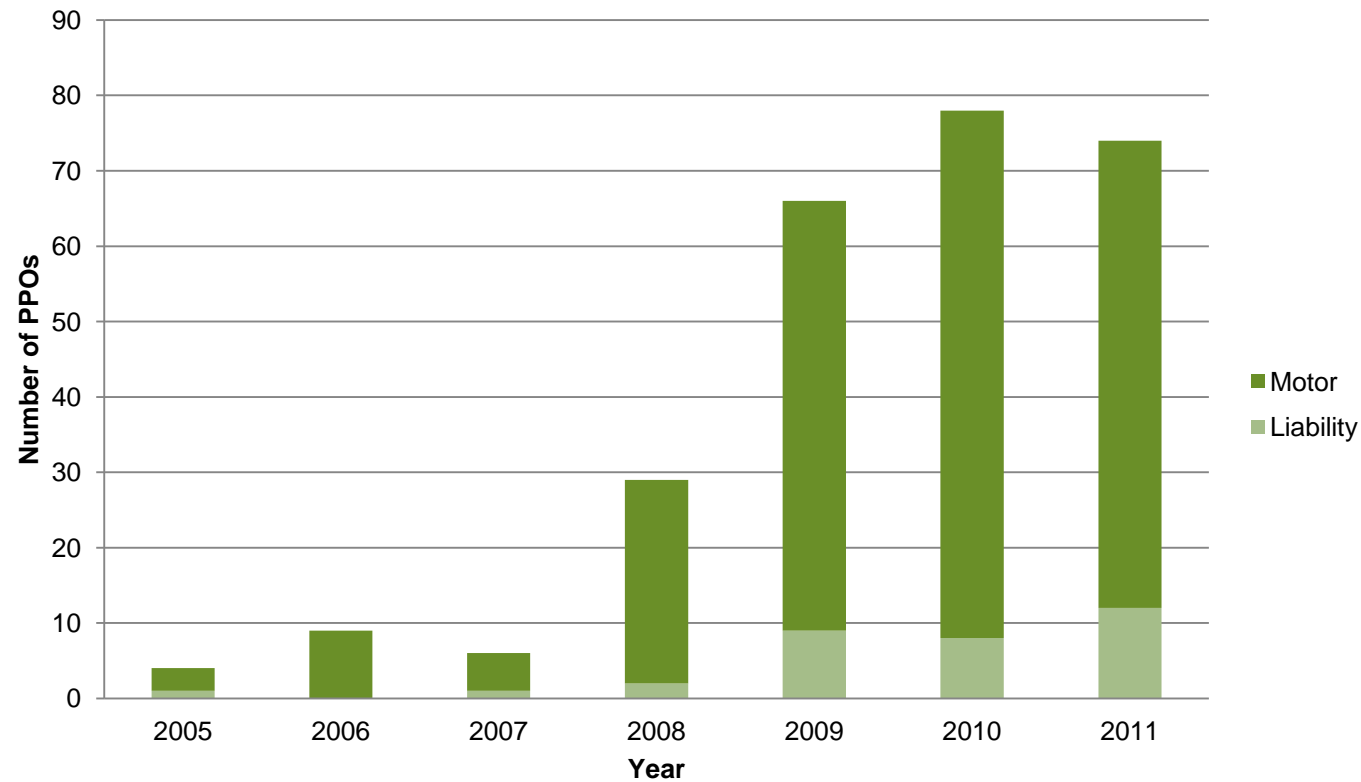- Be aware of use of settlement year

Contributors

Ageas

CFS

Provident

RSA

Aviva

Liverpool Victoria

NFU Mutual

Chartis

Allianz Insurance

AXA

Ecclesiastical

MMA

Direct Line Group

Zurich Insurance

esure

Groupama

2012 PPO survey

- **Propensity**
- Mortality
- Industry Practice
- Reserves held
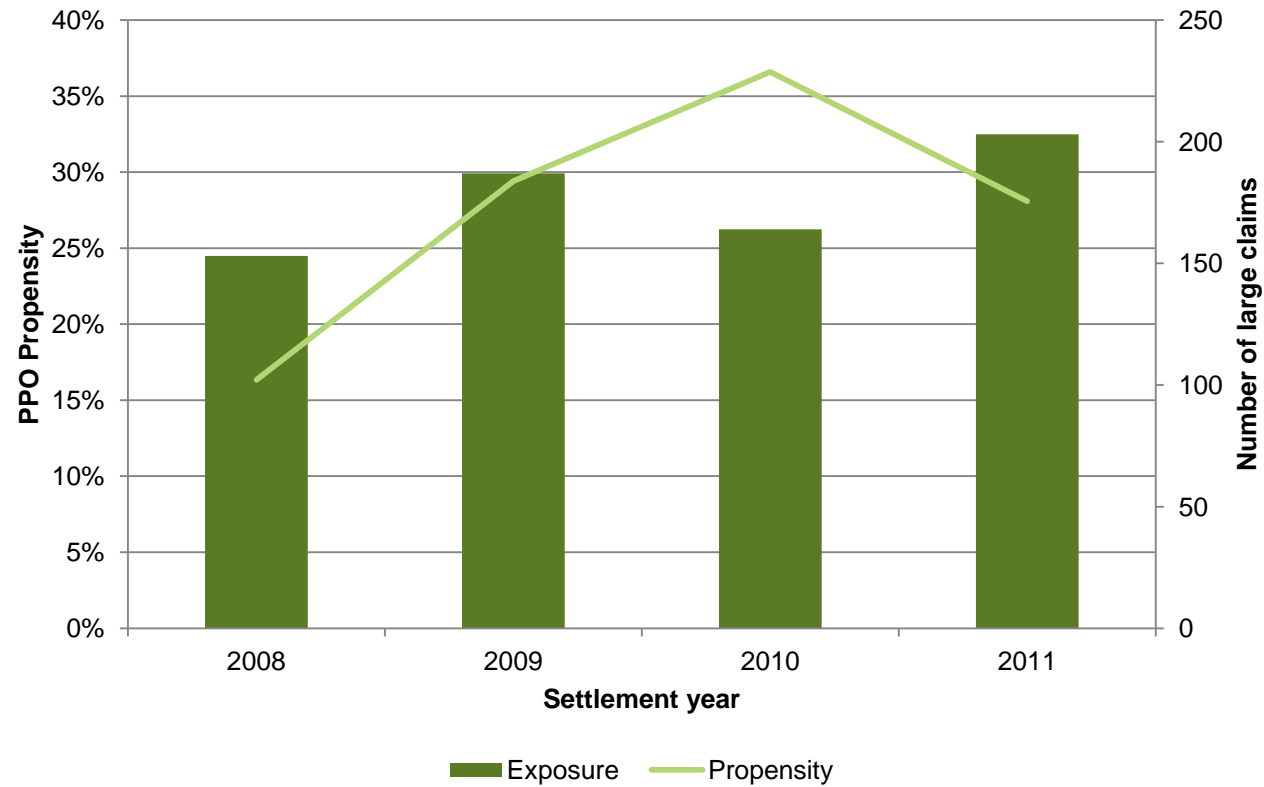- Industry Opinion
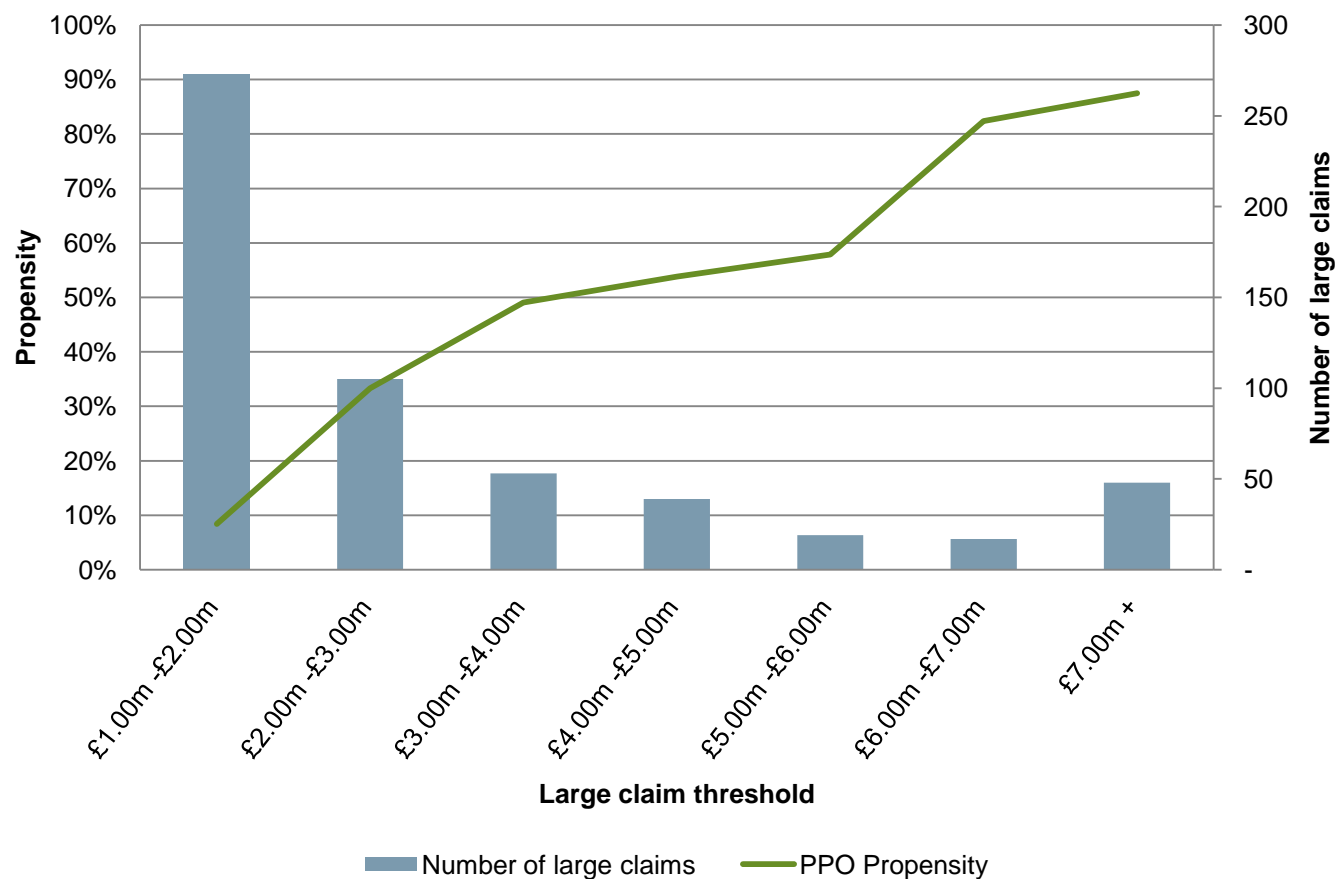- Looking ahead

Propensity

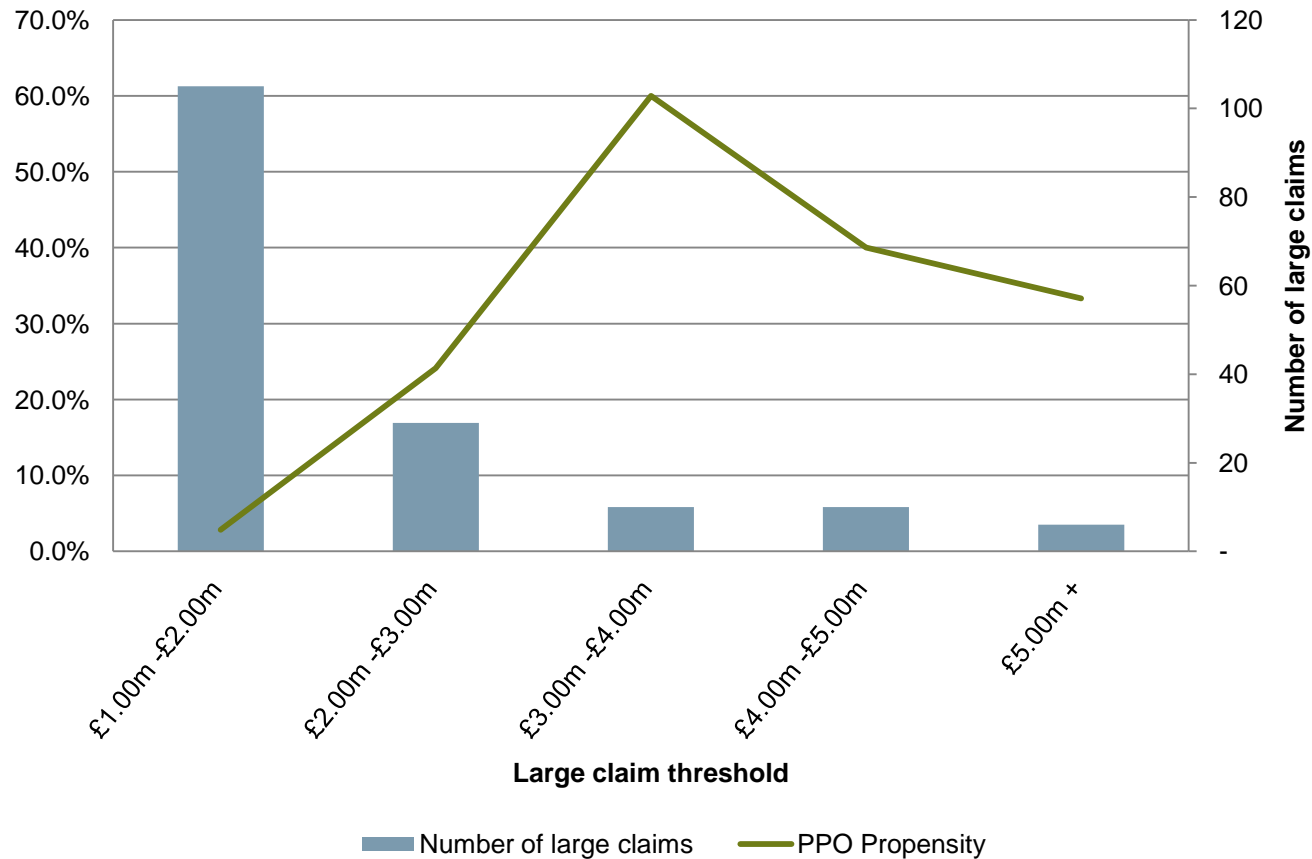## Number of claims settled

Propensity

Propensity – large claims

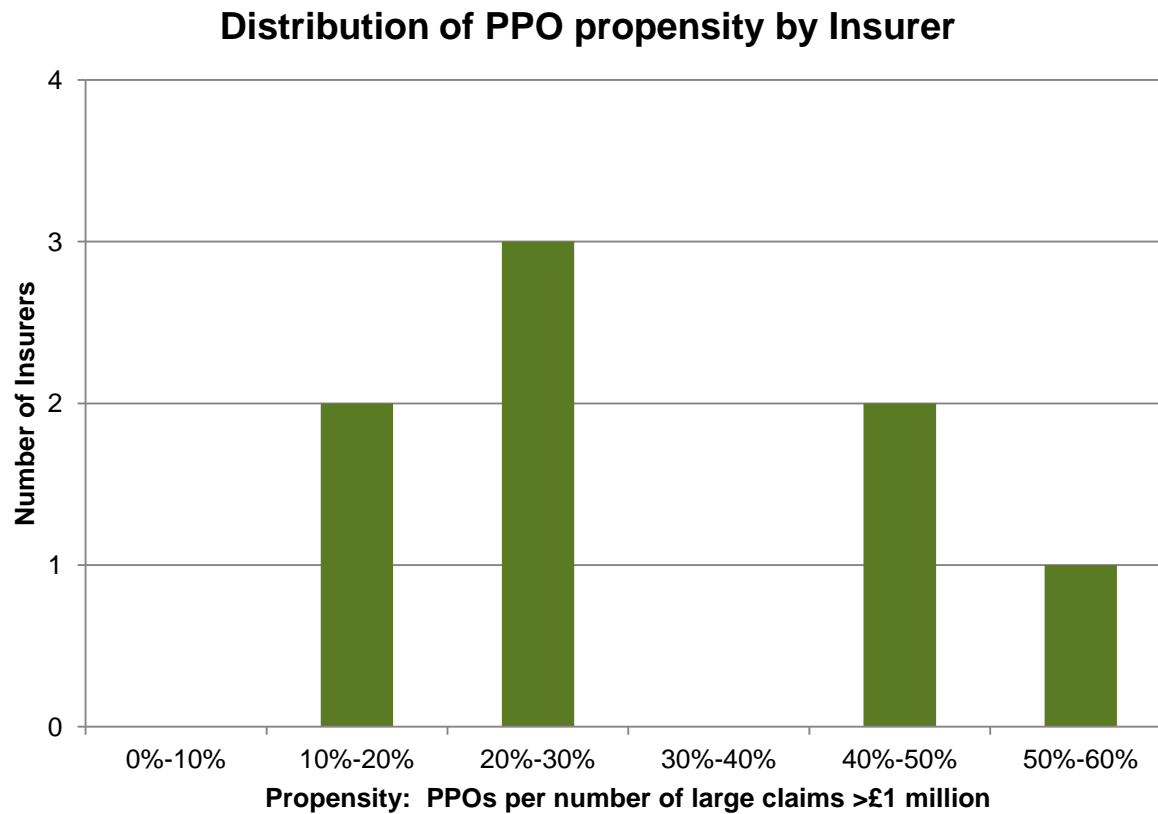# Propensity
Motor

Propensity by large claim threshold

Propensity Liability

Propensity by large claim threshold

Propensity

Variation by insurer

Distribution of PPO propensity by Insurer

(Chart: Number of Insurers vs Propensity: PPOs per number of large claims >£1 million)

- 0%-10%: 0
- 10%-20%: 2
- 20%-30%: 3
- 30%-40%: 0
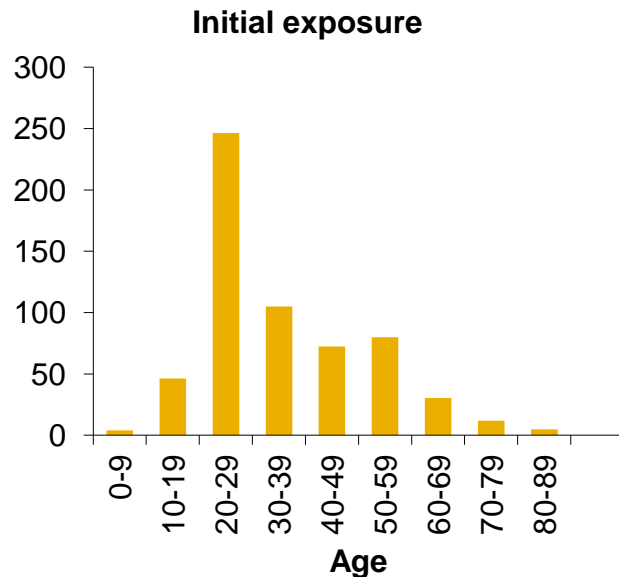- 40%-50%: 2
- 50%-60%: 1

2012 PPO survey

- Propensity
- Mortality
- Industry Practice
- Reserves held
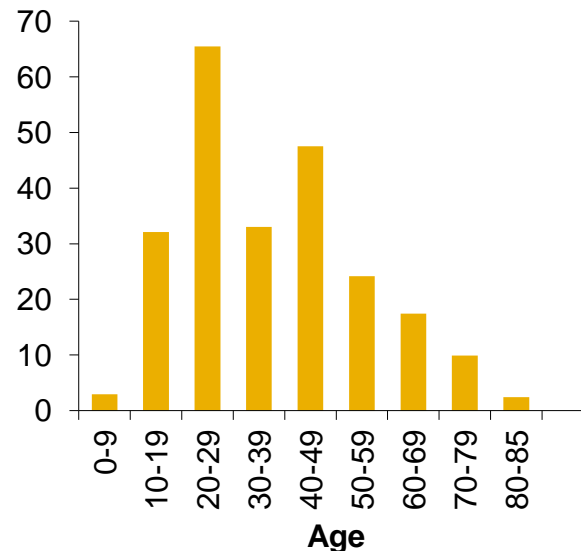- Industry Opinion
- Looking ahead

Mortality
Industry analysis

- 835 person years (600 male, 235 female)
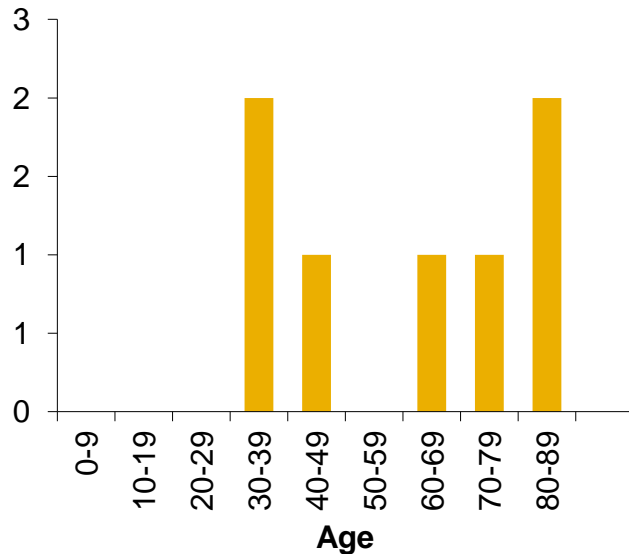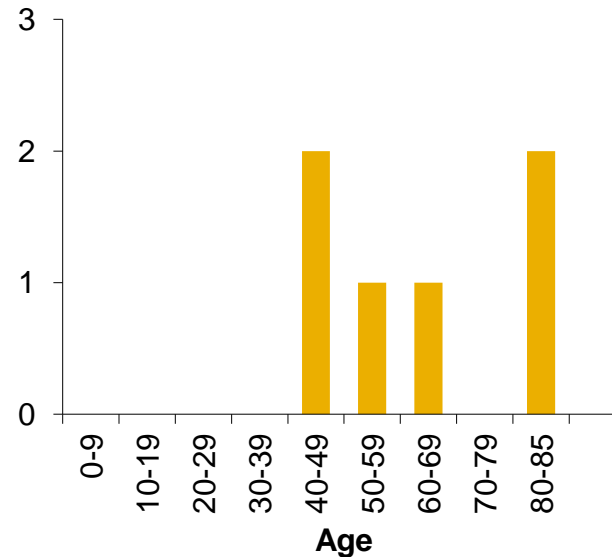 - MIB data included to increase credibility

Males

Females

Mortality
Industry analysis

- **835** person years (600 male, 235 female)
- 13 deaths (7 male, 6 female)

Males

Females

Mortality
Industry analysis - qualifiers

- Credibility
  - data from 2006 to 2011 only

- Model error
  - assumption of a homogeneous cohort
  - assumption of impairment adjustment
    - constant multiplier to q_x

Mortality
Life impairment adjustments

Mortality rates - age 20, life expectancy 43 years
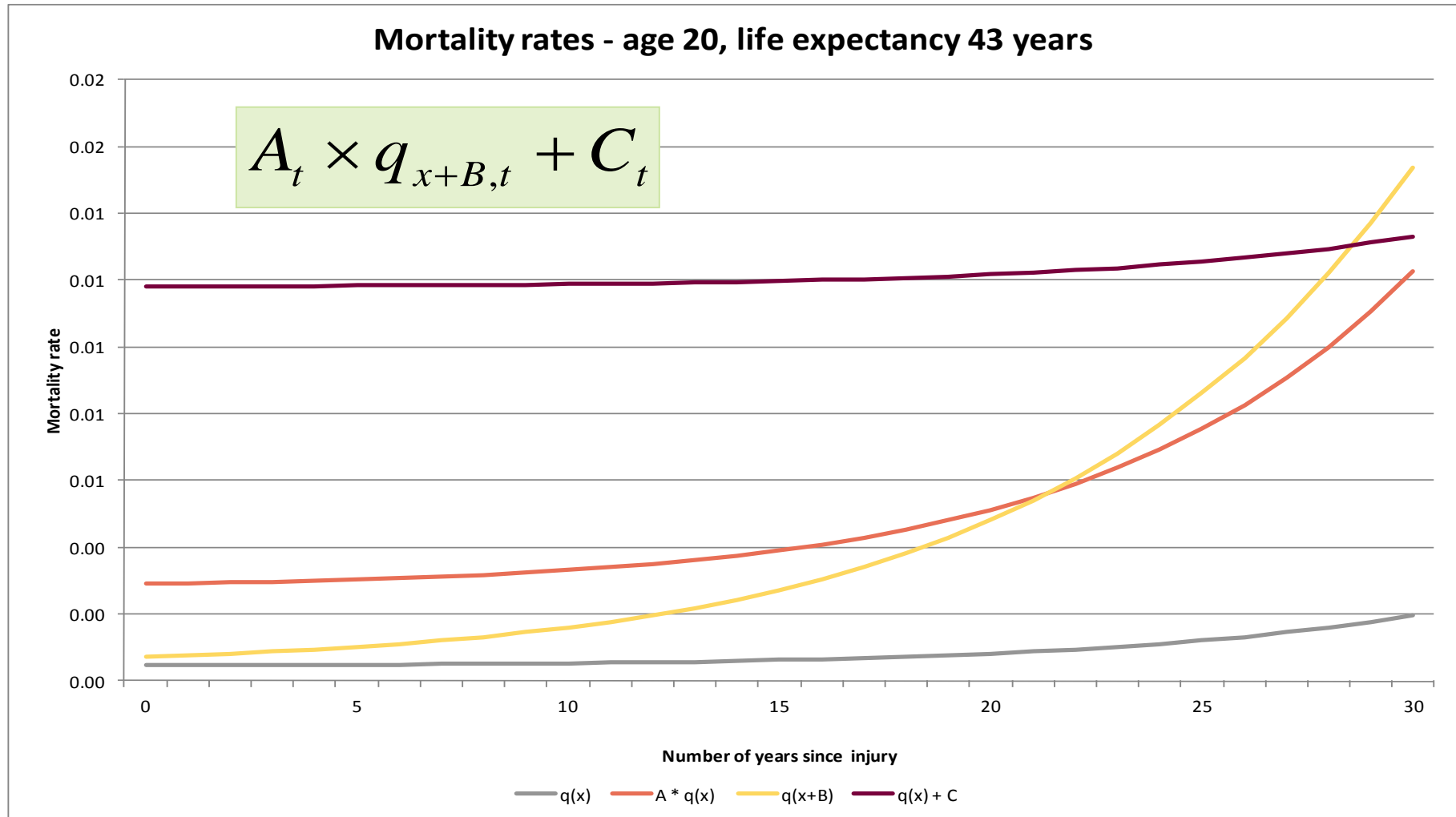
$$A_t \times q_{x+B,t} + C_t$$

Mortality
Industry analysis - qualifiers

- Credibility
  - data from 2006 to 2011 only
- Model error
  - assumption of homogeneous lives
  - assumption of impairment adjustment
    - constant multiplier to q_x
    - mortality will often be higher in the period after the accident
    - data in early stages of development

Mortality
Industry analysis - results

- Males 3 times q_x
- Females 8 times q_x

Percentile	Males	Females
5th	575%	1550%
25th	398%	1043%
50th	309%	792%
75th	239%	601%
90th	190%	469%
95th	166%	405%

Mortality

Comparison to rates recorded by insurers

Survey experience

Percentile	Males	Females
5th	575%	1550%
25th	398%	1043%
50th	309%	792%
75th	239%	601%
90th	190%	469%
95th	166%	405%

Company estimates

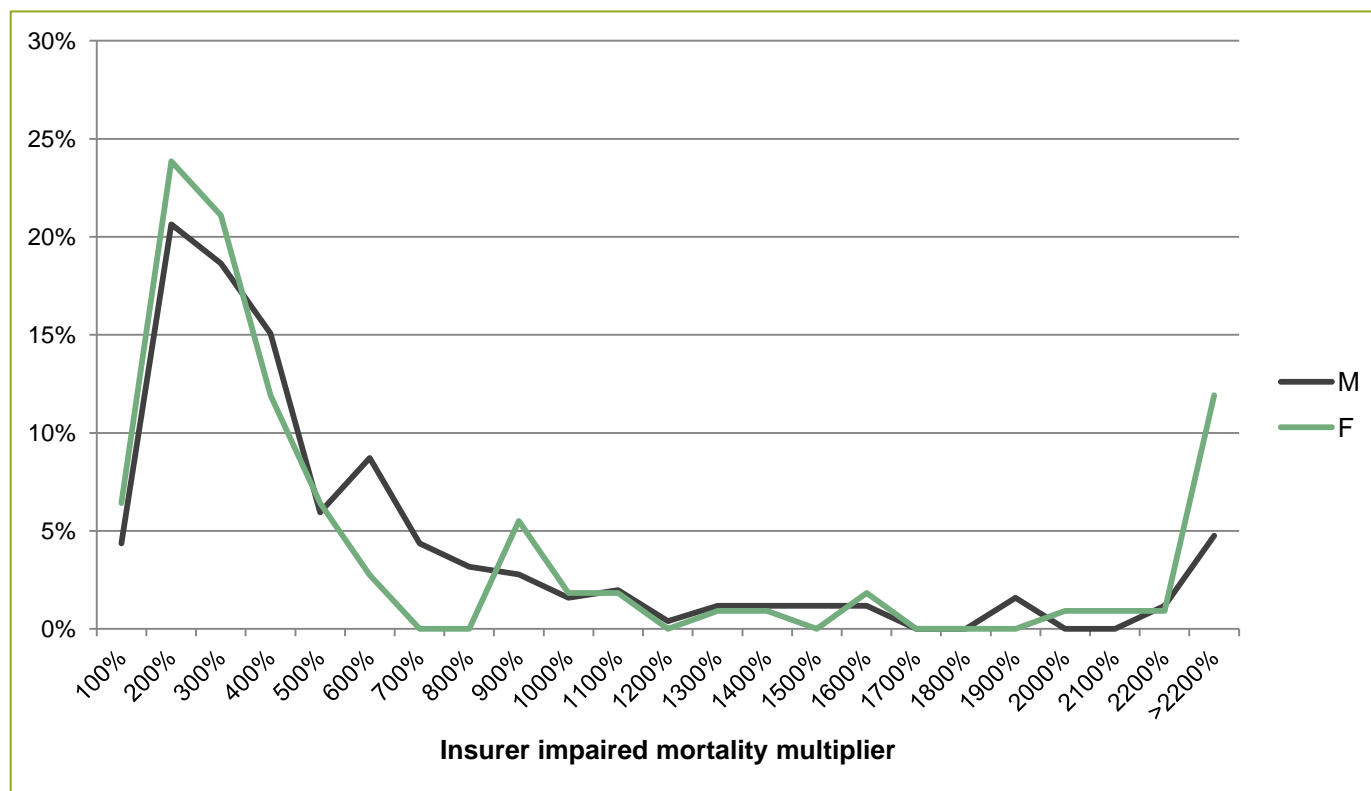| Percentile	Males	Females
5th	2176%	5776%
25th	624%	853%
50th	331%	258%
75th	199%	183%
90th	130%	107%
95th	105%	92%

Mortality

Comparison to rates recorded by insurers
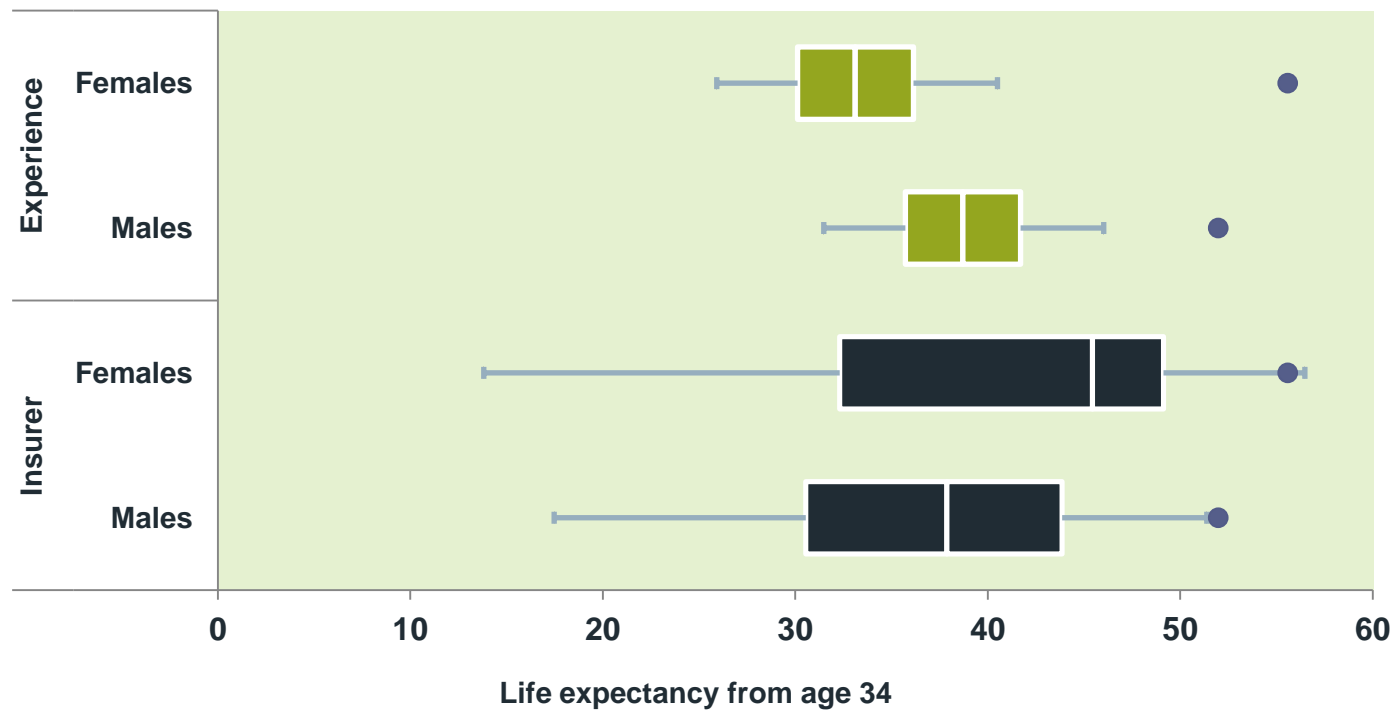
Mortality

Industry recorded rates

- Note the tail

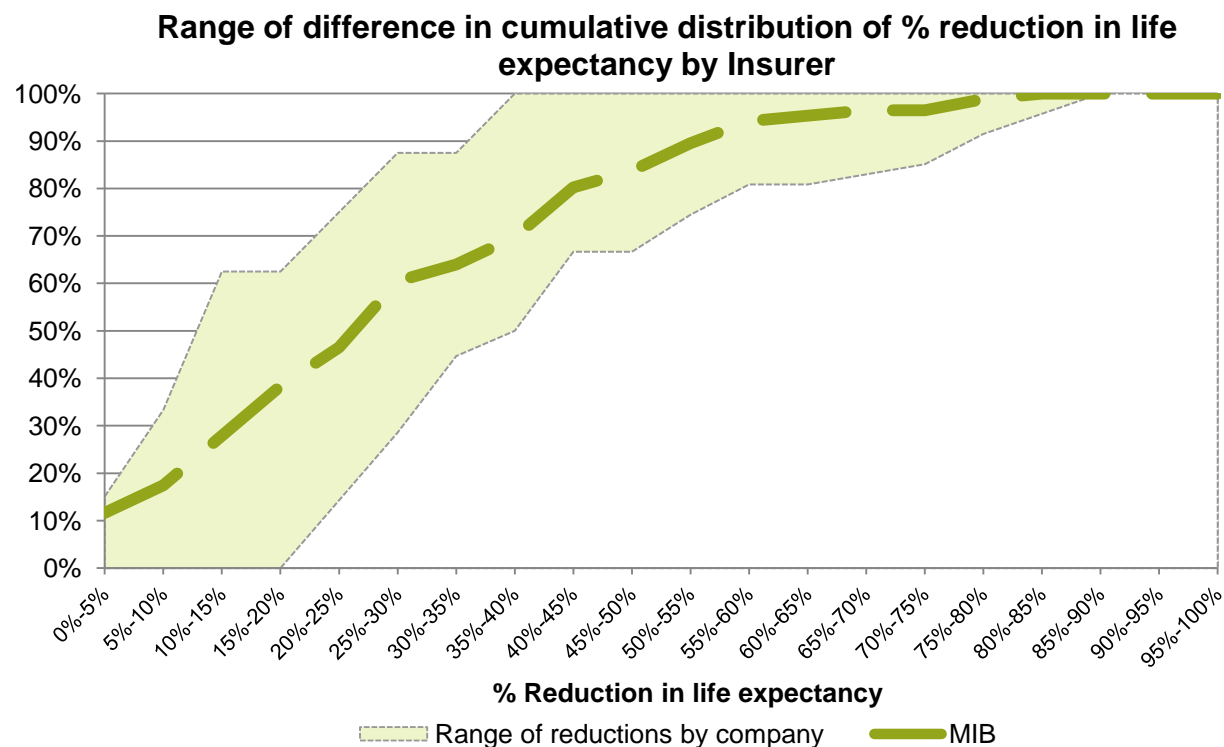- – Industry estimates will reflect differences in base health between individuals

Mortality

Industry recorded rates

- Evidence of inconsistencies in the market

Range of difference in cumulative distribution of % reduction in life expectancy by Insurer

will have direct impact on reserve estimate

2012 PPO survey

- Propensity
- Mortality
- Industry Practice
- Reserves held
- Industry Opinion
- Looking ahead

Industry practice and opinion

Qualitative survey

- Typically 1 hour telephone interview with senior actuaries
- Largest 10 contributors (bar one) all took part

Industry practice
Reserving

- All companies monitor individual large claims for the potential of them becoming PPOs
  - Typically undertaken by claims team
  - Inconsistencies in triggers used
    - Size of care costs
    - Injury type
- Almost no companies were monitoring the success of these predictions
  - Views on accuracy varied, most did not know

Industry practice
Reserving – known PPOs

- Cashflow approach used by virtually all respondents

- Mortality methodology varied

  - fewer using annuity certain approach than a year ago

  - variety of degrees of sophistication of using q_xs

    - most using simplest age adjusted method

    - Ogden 7 tables commonly cited

    - longevity adjustments more common

Industry practice
Reserving – IBNER/IBNYR PPOs

- Variety of approaches and levels of sophistication
  - Overall lump sum to cover all large claims
  - For IBNER:
    - Cashflow modelling of individual large claims with probability of becoming a PPO applied
    - Very common approach
    - Lack of certainty over the selected probability parameters
  - For IBNYR or total (IBNR):
    - Numbers and averages approach
    - Methodology for deriving the average varies
  - Stochastic model

Industry practice
Stochastic models

- Invaluable process to develop understanding of risk

- Wide ranging applications
  - Reserve uncertainty
  - Cost of capital
  - RI structure and negotiation

- Helps with communicating and quantifying of risk

- Very few insurers have developed stochastic models

Industry practice
Stochastic models

Not easy to parameterise a PPO model

- Need to take a view on some assumptions
  - Propensity
  - Investment returns
  - ASHE
  - Mortality
- Embed key decision makers in the process
- Correlations

Industry practice

- Lack of consistency in the market
  - Methodology
    - Reserving
    - Pricing
    - Capital modelling
  - Assumptions
    - Propensity
    - Mortality
    - Discount rate

Industry practice
Discount rate

- Wide range
  - From risk free yield curve to 2.25%
- Based on:
  - Risk free yield curve
  - Long term real gilt yields
  - Advice from investment departments
    - consistent with the assets backing the PPOs

2012 PPO survey

- Propensity
- Mortality
- Industry Practice
- Reserves held
- Industry Opinion
- Looking ahead

Industry practice
Reserves held

- Calculated reserve for each PPO in the survey
  - same method applied to all
  - recalculated for different discount rates
  - life expectancy taken as that provided in the survey data
- Compared to reserves held in FSA returns
  - Known PPOs shown as a proportion of OS
  - PPO estimate including IBNR shown as a proportion of OS + IBNR
    - crude estimate of IBNR
  - Only compared results for companies listed in FSA returns
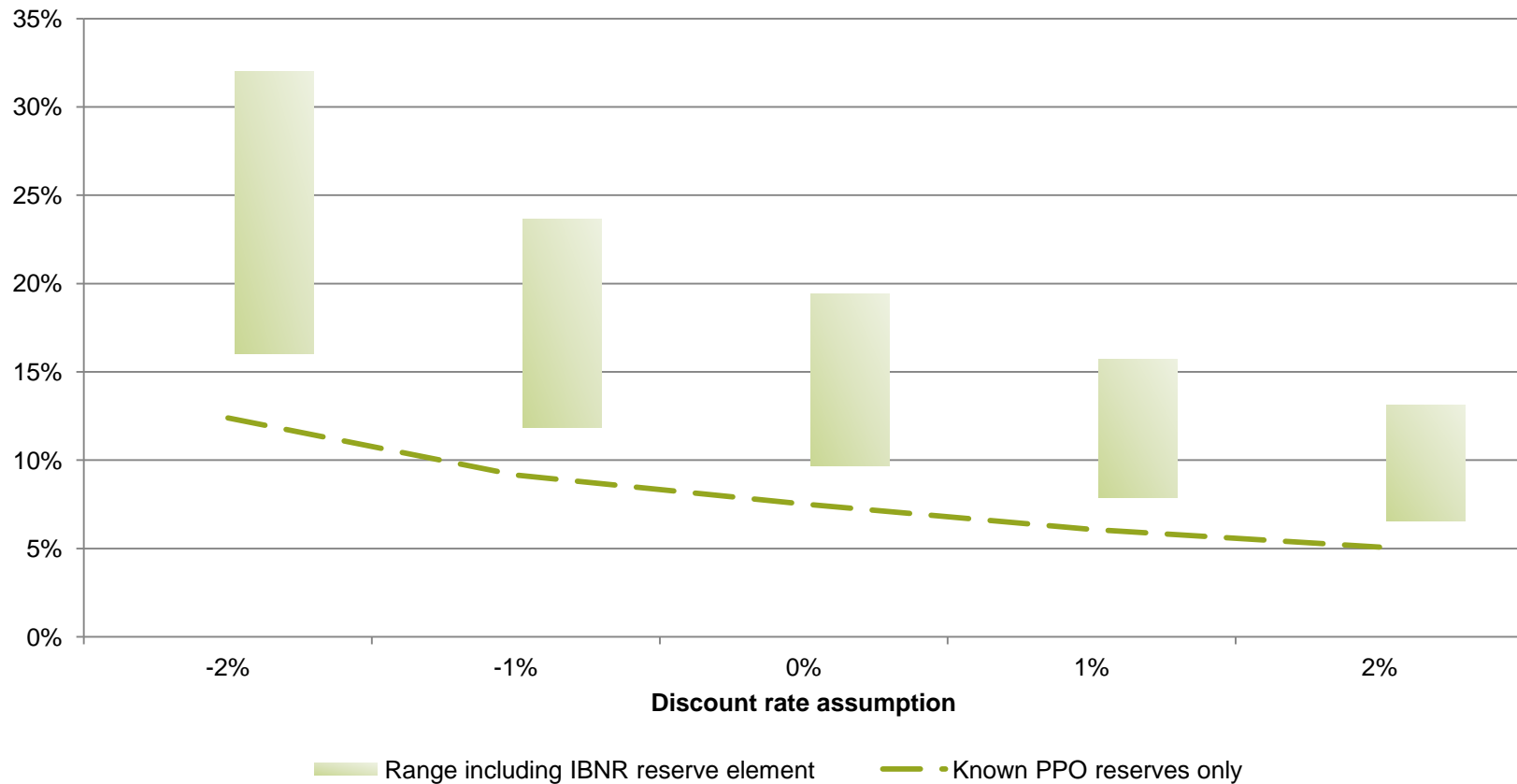
Industry practice
Reserves held

- Not a perfect analysis
  - some elements will not have been captured in the estimates such as multiple claimants and variation orders
  - figures will be slightly understated
    - not all PPOs in survey had complete data
    - 7% of PPOs excluded
- Take with a pinch of salt
  - intended to give a broad indication only
  - uncertainty, uncertainty, uncertainty

Industry practice
Reserves held

Motor PPO reserves as a proportion of reserves shown in FSA returns

Discount rate assumption

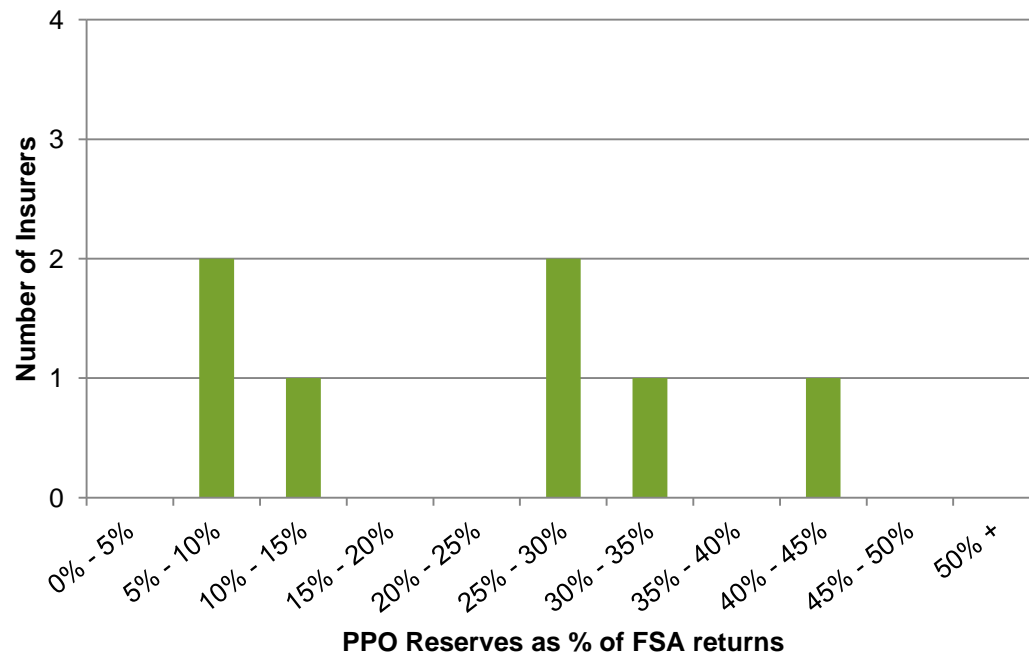Range including IBNR reserve element — • Known PPO reserves only

NB: IBNR PPO range estimated by assuming total PPO reserve is 2-4 times known PPO estimate

Industry practice
Difficult to compare motor insurance performance

Motor PPO reserves as a proportion of reserves shown in FSA returns

– significant differences by company

Impacted by:
- Propensity
- Mortality
- Discount rate
- Reserving methodology
- Reserving philosophy
- Growth/contraction of business over time

NB: IBNR PPO element crudely estimated by assuming total PPO reserve is 3 times known PPO estimate

PPO reserves calculated using 0% discount rate

2012 PPO survey

- Propensity
- Mortality
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- Reserves held
- Industry Opinion
- Looking ahead

Industry opinion

- Lack of consensus
- Issues concerning insurers
    - Future propensity
    - Longevity
    - Reserve uncertainty
    - Reinsurance
- Emergence of a buyout vehicle/pooling solution
- Capitalisation clauses
- Trend emerging in clauses asking for update on medical condition

2012 PPO survey

- Propensity
- Mortality
- Industry Practice
- Reserves held
- Industry Opinion
- Looking ahead

Looking ahead

- Reinsurance market

- Growth of stochastic models

- Convergence of methodologies – best practice emerging

- Development of assumptions

  - Monitor success of propensity predictions

  - Increased understanding of mortality techniques

  - Investigations into impaired mortality

  - 4th industry survey!

Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenter.